

Name: \_\_\_\_\_ Date: \_\_\_\_\_

## Student Exploration: Dividing Fractions

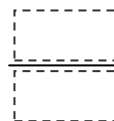
**Vocabulary:** divisor, dividend, fraction, quotient, reciprocal, simplify

**Prior Knowledge Questions** (Do these BEFORE using the Gizmo.)

1. Kyle has two 6-foot long boards. He cuts one of the boards into 2-foot pieces.

A. How many pieces does he cut? \_\_\_\_\_

B. A **fraction** is the relationship between a part and a whole. What fraction of this board is each 2-foot piece?

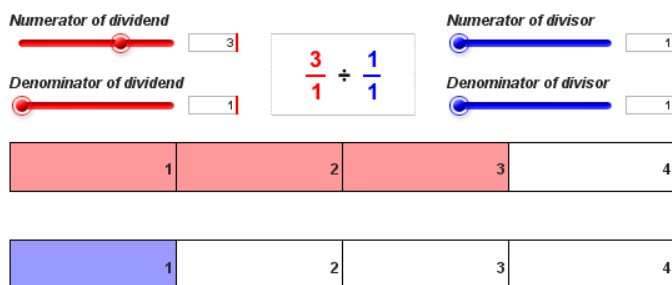


2. He cuts the other 6-foot board into  $\frac{1}{2}$ -foot pieces. How many pieces does he make? \_\_\_\_\_

### Gizmo Warm-up

In the *Dividing Fractions Gizmo™*, you use area models to divide two fractions. The red model represents the **dividend**. The blue model represents the **divisor**.

The numerators and denominators can be changed by dragging the sliders. (Or, click in the text field next to a slider, type a number, and hit **Enter**.)



1. Set the dividend to  $\frac{3}{1}$  and the divisor to  $\frac{1}{1}$  to model  $\frac{3}{1} \div \frac{1}{1}$ , or  $3 \div 1$ , as shown above.

A. How many 1's (blue areas) does it take to make 3 (the red area)? \_\_\_\_\_

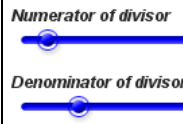
B. What is  $3 \div 1$ ? \_\_\_\_\_

2. Turn on **Show ruler**. Drag the **Divisions per unit** slider to 1 so each unit on the ruler is the same length as each unit in the divisor. Then, use the ruler to measure the dividend.

A. Change the divisor to  $\frac{1}{2}$ . Look at the ruler. It shows the number of  $\frac{1}{2}$ 's in one 3.

How many one-halves (blue areas) does it take to make 3 (the red area)? \_\_\_\_\_

B. What is  $3 \div \frac{1}{2}$ ? \_\_\_\_\_

<b>Activity A:</b> <b>Finding the quotient</b>	<u>Get the Gizmo ready:</u> <ul style="list-style-type: none"> <li>• Turn off <b>Show ruler</b>.</li> </ul>	
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1. With the dividend set to  $\frac{3}{1}$ , set the divisor to  $\frac{1}{3}$ . This models the expression  $3 \div \frac{1}{3}$ .

A. How many  $\frac{1}{3}$ 's does it take to make 3? \_\_\_\_\_

B. What is  $3 \div \frac{1}{3}$ ? \_\_\_\_\_

C. What do you think  $3 \div \frac{1}{4}$  equals? \_\_\_\_\_ Why? \_\_\_\_\_

D. Model  $3 \div \frac{1}{4}$  in the Gizmo. Turn on **Show calculation**. Fill in the equation at the right to show the product that is equivalent to  $3 \div \frac{1}{4}$ .

$$\begin{array}{|c|} \hline \phantom{0} \\ \hline \phantom{0} \\ \hline \end{array} \cdot \begin{array}{|c|} \hline \phantom{0} \\ \hline \phantom{0} \\ \hline \end{array} = \begin{array}{|c|} \hline \phantom{0} \\ \hline \phantom{0} \\ \hline \end{array}$$

E. Switching the numerator and denominator of a fraction gives you the **reciprocal**. How can you use a reciprocal to divide fractions? \_\_\_\_\_

2. Turn off **Show calculation**. Set the dividend to  $\frac{1}{4}$  and the divisor to 3.

A. What do you think  $\frac{1}{4} \div 3$  equals? \_\_\_\_\_ Why? \_\_\_\_\_

B. What product gives you this quotient? \_\_\_\_\_ Check in the Gizmo.

3. You have now done division by a fraction less than one ( $3 \div \frac{1}{4}$ ) and by a number greater than one ( $\frac{1}{4} \div 3$ ). What do you notice about the quotients? \_\_\_\_\_

(Activity A continued on next page)

**Activity A (continued from previous page)**

4. Turn off **Show calculation**. Set the dividend to  $\frac{1}{2}$  and the divisor to  $\frac{1}{4}$ .

A. What is  $\frac{1}{2} \div \frac{1}{4}$ ? \_\_\_\_\_ How do you know? \_\_\_\_\_

\_\_\_\_\_

B. What product gives you this quotient? \_\_\_\_\_ Check in the Gizmo.

5. Turn off **Show calculation**. Model the quotient  $\frac{5}{2} \div \frac{1}{3}$ .

A. What would you estimate the quotient above to equal? \_\_\_\_\_

Why? \_\_\_\_\_

- B. Turn on **Show ruler** and set **Divisions per unit** to 2. Then use the ruler to find the quotient. Fill in the equation below to show the quotient.

$$\frac{5}{2} \div \frac{1}{3} = \frac{\boxed{\phantom{00}}}{\boxed{\phantom{00}}} \cdot \frac{\boxed{\phantom{00}}}{\boxed{\phantom{00}}} = \frac{\boxed{\phantom{00}}}{\boxed{\phantom{00}}}$$

- C. Turn on **Show calculation**. Notice that the final answer is a mixed number. Explain how the mixed number is shown by the ruler. \_\_\_\_\_

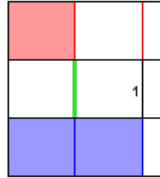
- D. Compare the denominator of the quotient and the divisions per unit on the ruler.

What do you notice? \_\_\_\_\_

6. Find each quotient, written in simplest form and as a mixed number when possible. Write all your steps below each problem. Then check your answers in the Gizmo.

A.  $\frac{2}{3} \div \frac{4}{3}$

B.  $\frac{7}{3} \div \frac{1}{4}$

<b>Activity B:</b>  <b>Finding missing numbers</b>	<u>Get the Gizmo ready:</u> <ul style="list-style-type: none"> <li>• Turn on <b>Show ruler</b>.</li> <li>• Set <b>Divisions per unit</b> to 1.</li> <li>• Turn off <b>Show calculations</b>.</li> </ul>	
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1. The quotient of the two fractions shown in the equation at the right is 2. The numerator of the divisor is missing.
- $$\frac{1}{2} \div \frac{\boxed{\phantom{000}}}{4} = 2$$

- A. In the Gizmo, model the equation above. Drag the **Numerator of divisor** slider until the quotient is 2. Fill in the equation above with the missing numerator.
- B. Turn on **Show calculation** to check your answer. How can you use a product to find the missing number? \_\_\_\_\_
- \_\_\_\_\_

2. Turn off **Show calculation**. The quotient of the two fractions shown at the right is  $1\frac{1}{3}$ . The numerator of the dividend is missing.
- $$\frac{\boxed{\phantom{000}}}{3} \div \frac{1}{2} = 1\frac{1}{3}$$

- A. What is the quotient  $1\frac{1}{3}$  written as an improper fraction?

$$\frac{\boxed{\phantom{000}}}{\boxed{\phantom{000}}}$$

- B. Be sure **Show ruler** is turned on. What will **Divisions per unit** need to be set to in order to model this quotient? \_\_\_\_\_ Explain: \_\_\_\_\_
- \_\_\_\_\_

- C. In the Gizmo, model the equation at the right. Use the model to fill in the missing numbers in the equation. Then check your answer in the Gizmo.
- $$\frac{\boxed{\phantom{000}}}{3} \div \frac{1}{2} = \frac{\boxed{\phantom{000}}}{3} = 1\frac{1}{3}$$

3. Fill in the blanks. Write all your steps below each problem. Then check in the Gizmo.

A.  $\frac{2}{3} \div \frac{4}{\boxed{\phantom{000}}} = \frac{1}{3}$

B.  $\frac{\boxed{\phantom{000}}}{2} \div \frac{2}{3} = 3\frac{3}{4}$

C.  $\frac{7}{\boxed{\phantom{000}}} \div \frac{3}{2} = 1\frac{1}{6}$